

be desirable. Through this linking, while at the same time determining the eco-efficiency, the costs and benefits of an ecological improvement measure could also be worked out.

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## Preventive Ecological LCA of Printing Process with 'Green FIT' Software

Comparison of Three Different Printing Processes Currently Available

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Three different printing processes (cardboard-, role-, and screen-printing processes) currently available were examined with the aim of establishing the most environmentally sound printing process. Based on the data of energy and mass flows for each of the printing processes, inventory analyses are compiled.

The calculation is carried out for 2,000 pieces of etiquette and a first rough estimated relative standard deviation is assigned to each data. The role-printing process is chosen as a comparison printing process. The equivalence of three mentioned printing processes is considered by using the same functional unit and equivalent methodological considerations (e.g. data quality, system boundaries). Application of the fuzzy-set preventive evaluation methodology and the 'Green FIT' software for three printing processes enables to identify the most environmentally friendly printing process. The 'Green Fitness' of cardboard- and screen-printing processes results in 0.62 and 3.32 respectively, whereas the role printing process has a fixed value of 1.0. The Green Fit-

ness Value of 0.62 leads to an improvement of eco-efficiency of 38 per cent or causes the 62 per cent of 'environmental loads' of the role printing process. In conclusion, the cardboard-printing process is the most environmentally friendly printing process. In addition to the better Green Fitness, there are also no overlaps of the fuzzy-sets in the final result. Because of this non-overlapping, one can conclude that even in the worst case cardboard is better than the screen-printing process regarding its environmental friendliness. Or in other words: even with a rough estimation of the energy and mass flow up to 55 per cent, the result is totally clear. Green FIT Software supports the information relating to the emission which influences the ecological value 'Green Fitness' (Dominance analysis). The results of dominance analyses for printing processes were as follows: The emission is dominated by SO<sub>2</sub> sulphur dioxide, NO nitrogen oxide and NH<sub>3</sub> ammoniac, a result of the electric energy production. These three emissions make out 75 per cent (cardboard-printing process) and 65 per cent (screen-printing process) of the total emission.